



*X-Plain™*  
*Thoracotomy*

## Reference Summary

The occurrence of lung cancer has increased dramatically over the last 50 years.

Your doctor may have recommended an operation to remove your lung cancer.

If your doctor recommends surgical treatment for your condition, the decision whether or not to have surgery is also yours.

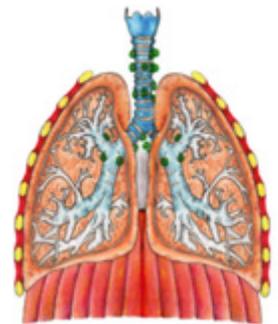
This reference summary will help you understand better the benefits and risks of this surgery.

### **Anatomy**

Oxygen is vital for life. Blood carries oxygen to the cells of the body.

In the lungs, the oxygen and carbon dioxide in our blood are exchanged. The air we breathe comes in close contact with the blood in the lungs.

The blood then fills with oxygen and releases unwanted carbon dioxide, CO<sub>2</sub>.



When we breathe, the air comes in through the mouth and/or nose and enters into the trachea or “air pipe.”

From there it goes into airways that get smaller and smaller. These airways are called bronchial tubes, or bronchioles.

We have two lungs: a right lung and a left lung. Each lung is divided into lobes. The right lung has 3 lobes and the left lung has 2 lobes.

The heart and major blood vessels are located in the middle and to the left of the chest in an area called the mediastinum.

A special membrane called pleura covers the lungs.

The ribs and the muscles that connect the ribs protect the lungs.

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The ribs expand when a large flat muscle, called the diaphragm, contracts or tightens. With the ribs expanded, air goes into the lungs. When the ribs get closer together and the diaphragm relaxes, air is pushed out of the lungs. This is how we breathe.

Lymph nodes are specialized structures that help fight infections. Cancer can invade these nodes on its way to other organs of the body.

## **Cancer and Its Causes**

The body is made up of very small cells. Normal cells in the body grow and die in a controlled way.

Cancer occurs when cells keep dividing and growing without the body's normal control. Cancer cells may also spread to different parts of the body through blood vessels and lymph channels. Cancer treatments may include surgery, chemotherapy, and radiation therapy.

Cancers in the body are given names depending on where the cancer started. Cancer that begins in the lung will be called a lung cancer even if it has spread to another place such as the liver, bone, or brain. The place where the cancer starts is called the primary site. If the cancer spreads to another area, it is called metastasis.

The cause of a cancer cannot be exactly determined. There are many factors that can be related to the cancer.

Each cell contains hereditary or genetic materials called chromosomes. This genetic material controls the growth of the cell. Cancer arises due to changes that occur in this genetic material. When the genetic material in a cell becomes abnormal, it loses its ability to control the growth of the cell.

Changes in genetic materials may also occur due to exposure to specific infections, drugs, tobacco, or other factors. However, lung cancer can develop in people who have not been exposed to tobacco.

## **Symptoms of Lung Cancer**

Lung cancer, like all cancers, begins as an abnormal growth of cells that have lost their ability to stop growing.

These cells can grow in the air passage just below the throat or anywhere along the breathing passages including all of the area of the lungs within the chest.

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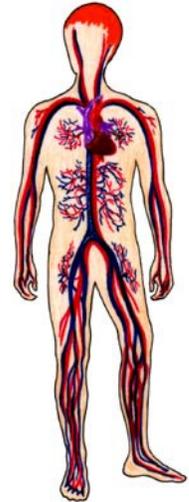
These cells can become a big mass. This mass can block some of the bronchioles causing breathing difficulties, cough, or chest pain.

These symptoms may not occur until a lung cancer has grown for many years. That is why many lung cancers are not found until they are at a very advanced stage.

This blockage can cause infections in the lungs known as pneumonia. This kind of pneumonia can be difficult to treat. This can cause the patient to have a persistent cough as well as blood in the sputum (phlegm).

If not treated, the cancer can move to the lymph nodes. It can also move to other organs, such as the bones and the brain, this is known as metastasis.

Lung cancer can also cause fluid to leak between the lungs and the chest wall. This is known as a pleural effusion. This can cause the lungs to collapse resulting in breathing difficulty as well as pain.



## Diagnosis

Lung cancer is usually suspected by seeing a spot or nodule on a chest x-ray.

Other tests, such as a CAT scan, or MRI, take pictures of your lungs and can help to detect infection, fluid around your lungs, or the location and size of a mass.

If your doctor finds an abnormal spot in your lung, a biopsy may be done.

During a biopsy, the doctor removes tissue from the spot and sends it to the lab to find out if the mass is cancerous. The biopsy can be done with a thin, lighted tube, called a bronchoscope that is passed through your mouth into your lungs.

Another way, a biopsy can be done with a needle. The needle is passed through the chest into the spot. A CAT scan is used so the doctor can see the spot. This is called a needle biopsy.

If the needle and bronchoscopic biopsies are not successful in diagnosis, an operation can be performed. During the operation, the mass along with a small amount of lung tissue is removed and sent to the lab to be examined.



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A pathologist studies the removed mass under the microscope to determine if the tumor is benign or malignant. Benign means non-cancerous and malignant means cancerous.

Non-cancerous tumors do not spread to other parts of the body.

If the mass is cancerous, your doctor may order a Pulmonary Function Test (PFT). This test gives your doctor an idea of how well your lungs are functioning and will help to determine whether you will tolerate having part of your lung removed.

## **Staging**

Before any treatment is recommended, a process called staging is usually conducted by the doctor. Staging involves tests to determine if the cancer has already spread beyond the lung to the lymph nodes or to other parts of the body.

Cancers that have spread beyond the lung are less likely to be cured with surgery.

If the cancer has spread, then usually chemotherapy and/or radiation treatments (with or without an operation) are recommended.

Part of staging lung cancer includes checking if the cancer has spread to the lymph nodes in the mediastinum.

This is done through a scope inserted in the upper chest in front of the trachea. This procedure is called mediastinoscopy.

During a mediastinoscopy, tissue samples are taken from the lymph nodes in the mediastinum. These samples are sent to the pathologist for examination to check if the cancer has spread to these nodes.

The treatment combination depends on how advanced the tumor is when it is discovered.

Your doctor will tell you what stage your cancer is, and will help you decide whether surgery is needed.

## **Thoracotomy**

During a thoracotomy, the surgeon removes part or all of one lung. This operation is performed under general anesthesia, meaning that you will be asleep and free from pain during this operation.

During a thoracotomy, the surgeon makes an incision across your side. Your rib cage is separated using special instruments in order to expose the lung.

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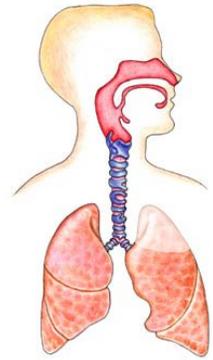
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This operation can sometimes be done using 3 to 4 smaller incisions and the use of scopes. This is known as video assisted thoracic surgery or thoracoscopic surgery. Such an operation results in less pain and a shorter hospital stay. Even though your surgeon may think that this is the best way to proceed, he or she may change his or her mind during the surgery and revert the operation to an open thoracotomy if he or she deems it safer for you.

During the operation, a part of a lobe may be taken out. This is known as segment resection or segmentectomy.

Sometimes a whole lobe may be taken out. This is known as lobectomy.

Sometimes the whole lung on that particular side is taken out. This operation is known as pneumonectomy.



The surgeon decides the size and location of the lung to be taken out. This depends on the size and location of the tumor and on how much your body can tolerate the surgery.

Lymph nodes in the chest may also be removed to help determine whether the tumor has extended beyond the original mass.

This will help decide whether additional treatment is needed after the surgery.

After the operation, one or more chest tubes may be placed in your chest. These tubes help drain fluid and air to the outside and help heal the remaining lung.



These tubes are taken out a few days after the operation.

## **Risks and Complications**

There are several possible risks and complications when you have surgery.

You need to know about them just in case they happen. By being informed, you may be able to help your doctor detect complications early.

The risks and complications include those related to anesthesia and those related to any type of surgery.

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Risks of general anesthesia include nausea, vomiting, urinary retention, cut lips, chipped teeth, sore throat, and headache. More serious risks of general anesthesia include heart attacks, strokes, and pneumonia.

Your anesthesiologist will discuss these risks with you and ask you if you are allergic to certain medications.

Blood clots in the legs can occur due to inactivity during and after the surgery. These usually show up a few days after surgery. They cause the leg to swell and hurt.

Blood clots can become dislodged from the leg and go to the lungs where they will cause shortness of breath, chest pain and possibly death. It is extremely important to let your doctors know if any of these symptoms occur. Sometimes the shortness of breath can happen without warning.

Getting out of bed shortly after surgery may help decrease the risks of blood clots.

Some of the risks are seen in any type of surgery. These rare risks include:

Infection, which can be at the incision site or deep in the lung such as pneumonia. In cases of severe infections another operation may be necessary.

Bleeding that may necessitate a blood transfusion.

A skin scar that may be painful or ugly.

Other risks and complications are related specifically to this surgery.

These again are very rare. However, it is important to know about them.

The nerves between the ribs may be damaged leading to numbness or persistent pain in the area of the incision or around the chest area.

Fluid or air may leak around the lung. This may necessitate the placement of another tube and may require a longer hospital stay.

## **After The Surgery**

You may spend a night in the intensive care unit, to allow the nurses to monitor their breathing, blood pressure, and heart closely. A breathing tube may be kept in place and the respiration assisted by a respirator. In such a case, the patient will not be able to speak.

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Deep breathing exercises will start soon after the operation. These exercises help expand the remaining lung tissue and decrease the chance of infections or pneumonia.

Patients are encouraged to get up and walk as soon as possible. This helps decrease complications such as blood clots in the legs.

Physical therapy is started to help strengthen your muscles. This will help you recover faster.

It is essential that patients **STOP SMOKING** immediately after lung surgery. This is the single most important thing a patient can do to help him or herself. If you smoke, **STOP NOW!**

You should refrain from heavy lifting and strenuous exercises until the follow up appointment.

You need to call your physician in cases of:

- Fever over 101 degrees F
- Drainage from the incision or incisions
- Bloody cough
- Severe chest pain, leg pain, or swelling, as this may be a sign of blood clots in the legs.

Further treatment may be needed in case of cancer. Radiation and chemotherapy may be necessary. Your surgeon and oncologist will help you determine the best course of future treatment.

## **Summary**

Lung cancer is one of the most common forms of cancer. Several treatment options are available to treat lung cancer. The recommended treatment depends on the stage of the cancer.

A lung operation may be recommended for biopsy or for removing the cancerous tissue.

Lung cancer operations are relatively safe. Risks and complications are rare but possible. Knowing about them will help you detect them early if they happen.

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